

REMARKS

Claims 1-29 and 31-32 are pending. By this amendment claim 30 has been cancelled and claim 19 is amended. Reconsideration in view of the amendments and the following remarks is respectfully requested.

The final rejection is improper at least because the rejection of claim 30, now incorporated into claim 19, for the reasons detailed below. Withdrawal of the finality of the rejection is respectfully requested.

Moreover, entry of this Amendment is proper under 37 CFR §1.116 since the Amendment: (a) places the application in condition for allowance; (b) does not raise any new issue requiring further search and/or consideration (since the amendments add more clarity to the claims and amplify issues contained in the original claims); (c) satisfies a requirement of form asserted in the previous Office Action; and (d) places the application in better form for appeal, should an appeal be necessary. The Amendment is necessary and was not earlier presented because it was made in response, at least in part, to arguments raised in the Office Action. Entry of the Amendment is thus respectfully requested.

Information Disclosure Statement

In paragraph 1 of the Office Action, the Examiner indicates that the July 28, 1999 IDS does not comply with the provisions of 37 C.F.R. However, the three Japanese language references identified and the Office Action correspond to U.S. Application serial numbers 08/463,550, 08/885,192 and 08/965,030, respectively. Accordingly, Applicants have complied with the English language requirement regarding the Japanese language references. Moreover, the Examiner has already initialed an Information Disclosure Statement acknowledging consideration of the U.S. applications.

Claim Rejections Under 35 U.S.C. § 102

Claims 5, 6, 10, and 26-28 were rejected under 35 U.S.C. 102(b) over Ruggiero et al. (US 4,878,770). This rejection is respectfully traversed.

Claim 5 defines a method of etching a metallic film on a thin film resistor, by dry-etching a first part of the metallic film and by wet-etching a second part of the metallic film to expose the thin film resistor. Thus, the metallic film is etched to expose the thin film resistor at two steps of dry-etching and wet-etching.

Ruggiero neither teaches nor suggests that the metallic film (i.e., TiW barrier layer 24) is etched to expose the thin film resistor 22 at two steps of dry-etching and wet-etching.

Ruggiero teaches on col. 3, lines 61-68 that wet etching is performed to remove aluminum, and then another wet etching is performed to remove the barrier layer 24. In this case, both etchings are wet. In another embodiment, Ruggiero further teaches on col. 4, lines 39-43 that all three layers 22, 24, 28 are removed by dry etching simultaneously. Thus, Ruggiero fails to teach not only that the barrier layer 24 is removed at the two steps of dry-etching and wet-etching, but also that the metallic layers on the thin film resistor 22 are removed at the two steps of dry-etching and wet-etching.

Therefore, claim 5 and its dependent claims (6, 10 and 26-28) are patentable over Ruggiero. Withdrawal of the rejection is respectfully requested.

Claim Rejections Under 35 U.S.C. § 103

Claims 7-9 and 11-18 were rejected under 35 U.S.C. 103(a) over Ruggiero. Claims 7-9 and 11 depend from allowable independent claim 5, which is addressed above. The rejection is respectfully traversed.

Claim 12 defines that the conductive film on the metallic film has a thickness equal to or less than 300 nm, and the conductive film is patterned so that a ratio of an upper surface

area of the conductive film (i.e. the metallic film) relative to an upper surface area of the thin film resistor is equal to or more than 0.02.

The Examiner correctly recognizes that Ruggiero fails to specify the thickness and the ratio defined in claim 12 (and numerical values defined in claims 7, 8, 11, and 13). However, the Examiner asserted that it would have been obvious to modify Ruggiero by employing a variety of processing variables such as the thickness and area of the metallic layer, and rejected these claims. Applicants respectfully disagree with this Examiner's assertion.

The specific ranges of the thickness and the ratio defined in claim 12 were found out by the inventors to suppress the under-cut of the metallic film and the overhanging of the conductive film caused by etching. More specifically, the inventors considered ionization tendencies of the thin film resistor, the metallic film, and the conductive film and found out the above specific values to solve the problems, as explained in the specification, from page 17, line 10 to page 20, line 22. Ruggiero neither teaches nor suggests the above problems to be solved by the invention.

Additionally, the inventors considered corrosion on a base metal should to control an etched shape of the metallic film and the conductive film. Ruggiero does not teach that an etched shape could have an unexpected shape due to corrosion and therefore, even through experimentation, it would not have been obvious to use the specific values since the problem was not known.

Therefore, claims 7-9 and 11-18 are patentable over Ruggiero. Withdrawal of the rejection is respectfully requested.

Claims 19, 20-25, 29, and 30 are rejected under 35 U.S.C. 103(a) over Nagahata in view of Iida. The rejection is respectfully traversed.

Claim 19 which is amended to include the subject matter of canceled claim 30, defines that the wet-etching is performed in a state where both the conductive film and the metallic film contact an etching solution. Claim 22 similarly recites that the first and second metallic films are both contacting the specific solution to have an electrode potential difference.

Neither Nagahata or Iida teach that these two films are in contact with the etching solution during the wet-etching process. As neither of the references teach this feature, no combination of these references would teach or suggest this feature of claims 19 and 22.

Therefore, claims 19, 20-25, and 29 are patentable over any combination of Nagahata and Iida. Withdrawal of the rejection is respectfully requested.

Conclusion

Applicants appreciate the indication that claims 1-4 are allowed. However, in view of the above amendments and remarks, Applicants respectfully submit that all the claims define patentable subject matter and that the entire application is in condition for allowance.

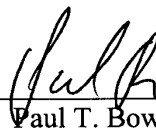
Should the Examiner believe that anything further is desired to place the application in better condition for allowance, the Examiner is invited to contact the undersigned at the telephone number listed below.

Attached hereto is a marked-up version of the changes made to the specification and claims by the current amendment. The attached Appendix is captioned "Version with markings to show changes made".

Respectfully submitted,

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APPENDIX

VERSIONS WITH MARKINGS TO SHOW CHANGES MADE

IN THE CLAIMS:

Claim 30 has been canceled and claim 19 has been amended as follows:

19. A method of etching a metallic film, comprising the steps of:

forming a thin film resistor on a semiconductor substrate through an insulation layer
interposed therebetween;

forming a metallic film on the thin film resistor;

oxidizing a surface portion of the metallic film to form a surface oxide layer on the
metallic film;

forming a conductive film on the surface oxide layer;

patterning the conductive film to form an opening in the conductive film, the opening
exposing the surface oxide layer therefrom; and

wet-etching the surface oxide layer and the metallic film,

wherein the conductive film is made of a metallic material different from that of the
metallic film, and

wherein the wet-etching is performed in a state where both the conductive film and
the metallic film contact an etching solution.